UNIVERSITI PUTRA MALAYSIA

STUDIES IN KEDAH-KELANTAN, BRAHMAN AND CROSSBRED BULLS AT PUBERTY AND SEXUAL MATURITY

ISMAYA

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STUDIES IN KEDAH-KELANTAN, BRAHMAN AND CROSSBRED BULLS AT PUBERTY AND SEXUAL MATURITY

By

ISMAYA

A thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in the Faculty of Veterinary Medicine and Animal Science Universiti Pertanian Malaysia

It is hereby certified that we have read this thesis entitled 'Studies in Kedah-Kelantan, Brahman and Crossbred Bulls at Puberty and Sexual Maturity' by Ismaya, and in our opinion it is satisfactory in terms of scope, quality, and presentation as partial fulfilment of the requirements for the degree of Master of Science

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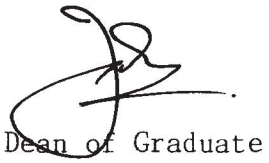

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Dedicated to Tini, H.S.

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LIST OF ABBREVIATIONS

CV	:	Coefficient of variation
^{o}C	:	Degrees centrigrade
cpm	:	Counter per minute
dpm	:	Disintegration per minute
FSH	:	Follicle stimulating hormone
gm	:	Gram
GnRH	:	Gonadotrophin releasing hormone
kg	:	Kilogram
LH	:	Luteinizing hormone
ml	:	Millilitre
MW	:	Molecule weight
ng	:	Nanogram
PGB	:	Phosphate Gelatin Buffer
pg	:	Picogram
pH	:	Potential hidrogen
RIA	:	Radioimmunoassay
rpm	:	Rate per minute
ug	:	Micogram
ul	:	Microlitre

Abstract of thesis presented to the Senate of Universiti Pertanian Malaysia in partial fulfilment of the requirements for the degree of Master of Science

STUDIES IN KEDAH-KELANTAN, BRAHMAN AND CROSSBRED BULLS AT PUBERTY AND SEXUAL MATURITY

by

ISMAYA

May, 1987

Supervisor : Assoc. Prof. Tan Hock Seng, Ph. D.

Co-Supervisor: Assoc. Prof. Tuan Ariffeen Bongso, Ph. D.

Faculty : Veterinary Medicine and Animal Science

Physiological differences within and between breeds could be important in genetic selection and in the planning of management programmes for maximization of reproductive efficiency.

Data for this study were obtained from 21 Kedah-Kelantan bulls (6 to 36 months of age) maintained at Universiti Pertanian Malaysia. Data were also obtained from 109 Kedah-Kelantan bulls and 105 Brahman bulls (6 to 72 months of age) and 25 crossbred bulls (13 to 36 months of age) maintained at Darabif Sdn. Berhad. Heart girth, body weight, scrotal circumference, testes volume, testis length and testis width in all three breeds were measured. Semen production and plasma

testosterone concentration were also investigated in Kedah-Kelantan bulls.

Relationship between age, body size and testis size were found to be significantly different for all three breeds. Brahman bulls were superior to Kedah-Kelantan bulls with crossbred bulls in between. In all three breeds, heart girth increased rapidly between 14 and 21 months of age, besides body weight, scrotal circumference, testes volume, testis length and testis width. At 6 to 12, 13 to 18 and 19 to 24 months of age, 0 per cent, 26.7 per cent and 83.3 per cent of Kedah-Kelantan bulls responded to electroejaculation, respectively. Whereas at over 30 months of age all Kedah-Kelantan bulls responded to electroejaculation. Semen quality was observed to increase with age.

Kedah-Kelantan bulls reached puberty at 482 $\pm$ 45 days of age, weighed 151.5 $\pm$ 30 kg with a heart girth of 129 $\pm$ 8 cm. At puberty, Kedah-Kelantan bulls had a semen volume of 2.6 $\pm$ 0.5 ml, sperm concentration of 320 $\pm$ 136 millions spermatozoa/ml, sperm motility of 47.5 $\pm$ 22.2 per cent and live sperm of 78.3 $\pm$ 2.7 per cent. Scrotal circumference, testes volume, testis length and testis width were 21.0 $\pm$ 2.6 cm, 282 $\pm$ 44 ml, 11.5 $\pm$ 1.5 cm and 4.5 $\pm$ 0.5 cm, respectively.

At sexual maturity, Kedah-Kelantan bulls had semen volume, sperm concentration, sperm motility and live sperm of 231 per

cent, 218 per cent, 71 per cent and 5 per cent higher than at puberty, respectively. Body weight, heart girth and scrotal circumference in mature bulls were 105 per cent, 33 per cent and 33 per cent higher than at puberty, respectively. Similarly, testes volume, testis length and testis width were 136 per cent, 50 per cent and 37 per cent higher than at puberty, respectively.

Mean testosterone concentration and mean testosterone peak in Kedah-Kelantan bulls increased ($P < 0.01$) with age and fluctuated during 10 hour periods. Mean testosterone concentration and testosterone peak increased from 0.42 to 6.37 ng/ml and 1.27 to 13.70 ng/ml between 6 and 36 months of age, respectively.

Abstrak tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian daripada syarat untuk ijazah Master Sains

KAJIAN KEBALIGHAN DAN KEDEWASAAN PADA LEMBU-LEMBU JANTAN KEDAH-KELANTAN, BRAHMAN DAN KACUKAN

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Perbezaan fisiologi dalam dan antara baka ternakan memainkan peranan penting dalam pemilihan genetik dan merancang program pengurusan untuk meningkatkan keberkesanan pembiakan.

Bahan untuk kajian ini diperolehi dari 21 ekor lembu jantan Kedah-Kelantan yang berumur antara 6 hingga 36 bulan yang diperlihara di Universiti Pertanian Malaysia, 109 ekor lembu jantan Kedah-Kelantan, 105 ekor lembu jantan Brahman yang berumur antara 6 hingga 72 bulan dan 25 ekor lembu kacukan yang berumur antara 13 hingga 36 bulan yang dipelihara di Darabif Sdn. Berhad, Pahang. Lilitan dada, berat badan, panjang keliling kerandut, isipadu buah pelir, panjang dan lebar buah

pelir ketiga-tiga baka telah diukur. Pengeluaran semen dan kadar p'asma testosteron lembu Kedah-Kelantan juga telah diselidiki.

Adalah didapati bahawa perhubungan di antara umur, saiz badan dan saiz buah pelir bagi ketiga-tiga jenis baka tersebut sangatlah berbeza. Lembu jantan Brahman lebih unggul daripada jenis Kedah-Kelantan, manakala mutu jenis kacukan pula adalah di antara keduanya. Bagi ketiga-tiga jenis, lilitan dada pesat berkembang di antara umur 14 hingga 21 bulan. Pada waktu yang sama, berat badan, panjang keliling kerandut, isipadu buah pelir serta panjang dan lebarnya juga pesat bertambah. Pada umur 6 hingga 12, 13 hingga 18 dan 19 hingga 24 bulan kadar tindakbalas lembu jantan Kedah-Kelantan terhadap 'electro-ejaculation' ialan 0 peratus, 26.7 peratus dan 83.3 peratus. Pada umur lebih daripada 30 bulan kesemua lembu jantan Kedah-Kelantan membuat tindakbalas terhadap 'electroejaculation'.

Lembu jantan Kedah-Kelantan mencapai tahap baligh pada umur 482 $\pm$ 45 hari dengan berat sebanyak 151.5 $\pm$ 30 kg serta lilitan dada 129 $\pm$ 8 cm. Ketika baligh, lembu Kedah-Kelantan telah menghasil semen sebanyak 2.6 $\pm$ 0.5 ml, kepekatan spermatozoa 320 $\pm$ 136 juta spermatozoa/ml, motiliti sperma 47.5 $\pm$ 22.2 peratus dan sperma hidup 78.3 $\pm$ 2.7 peratus. Ukuran panjang keliling kerandut, isipadu buah pelir, panjang dan lebar testes ialah 21.0 $\pm$ 2.6 cm, 282 $\pm$ 44 ml, 11.5 $\pm$ 1.5 cm dan 4.5 $\pm$ 0.5 cm.

Ketika mencapai kematangan, lembu Kedah-Kelantan mempunyai isipadu semen, kepekatan sperma, motiliti sperma dan sperma hidup sebanyak 231 peratus, 218 peratus, 71 peratus dan 5 peratus lebih tinggi daripada semasa baligh. Berat badan, lilitan dada dan panjang kerandut lembu yang telah mencapai kematangan adalah 105 peratus, 33 peratus dan 33 peratus lebih tinggi daripada ketika baligh. Dalam pada itu, isipadu buah pelir, panjang dan lebar testes adalah 136 peratus, 50 peratus dan 37 peratus lebih tinggi daripada ketika baligh.

Purata kadar testosteron dan purata kemuncak testosteron lembu jantan Kedah-Kelantan bertambah ($P < 0.01$) mengikut umur dan mengalami turun-naik dalam jangkamasa 10 jam. Purata kadar testosteron dan purata kemuncak testosteron bertambah dari 0.42 ke 6.37 ng/ml dan 1.27 ke 13.70 ng/ml pada umur 6 hingga 36 bulan.

CHAPTER I

INTRODUCTION

Kedah-Kelantan cattle, indigenous to Malaysia, represent a potential economic resource for beef cattle production in Malaysia. The animal has gone through a long process of adaptation in Malaysia with high fertility and they constitute a body size which is manageable by local farmers. Moreover, these cattle represent about 82 per cent of the prevailing total cattle population (Devendra and Lee, 1979).

Kedah-Kelantan cattle are relatively small in size with a lower average daily gain compared to Brahman and Brahman cross cattle. Clayton (1983) reported that average daily live weight gain for male animals were 0.36, 0.50 and 0.44 kg/day for Kedah-Kelantan, Brahman and Brahman cross cattle, respectively. The results indicated that Brahman bull could be used to upgrade the potential of Kedah-Kelantan cattle. The approach of crossbreeding will strengthen future breeding strategies to increase beef cattle number and quality.

Puberty may be defined as the point of development when a bull is capable of participating in reproduction. In the present study, puberty was defined as the time when a bull could respond by electroejaculation. Puberty has been defined

as the time when the bull's sexual organs are functionally developed, sexual instincts are prominent and reproduction is possible. Puberty should not be confused with sexual maturity, as the latter is attained at a later date when all systems are functioning at their maximum. Puberty is the time of first breeding potential, while sexual maturity is the time of maximum breeding potential. Pubertal characteristics in Bos indicus bulls have been described by Iqboeli and Rakha (1971) and more recently by Oyedipe et al. (1981), Fields et al. (1982) and Wildeus et al. (1984a). These studies have highlighted the delayed onset of puberty and slower rate of sexual maturation compared to Bos taurus bulls (Fields et al., 1982; Wildeus et al., 1984b). Studies in a tropical environment have shown differences in the development of sperm reserves in Brahman and Sahiwal derived crossbred bulls (Wildeus and Entwistle, 1983).

Furthermore, the lower pregnancy rates achieved with sires of Bos indicus breeding have been attributed to a poorer quality ejaculate (Iqboeli and Rakha, 1971; Fields et al., 1979) and smaller testes (Fields et al., 1979; Blockey, 1980). Besides that, breed groups with average testosterone concentration reached puberty earlier than breed groups of bulls with low testosterone concentration (Lunstra et al., 1978). Testosterone concentration in the first year of life has been studied for beef (Lunstra et al., 1978; Singal and Gomes, 1978) and dairy breeds (Thibier, 1975; Schanbacher,